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Steinike et al.

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(54) **SNOW THROWER IMPELLER**

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E01H 5/09 (2006.01)

(52) **U.S. Cl.** **37/251**; 37/259

(58) **Field of Classification Search** .... 37/222, 37/233, 248, 251, 252, 256, 259; 416/231 B, 416/234; 241/277, 278.1; 366/325.4, 328.3; D8/8; 172/13, 15; 30/347, 348, 351, 357; 56/295

See application file for complete search history.

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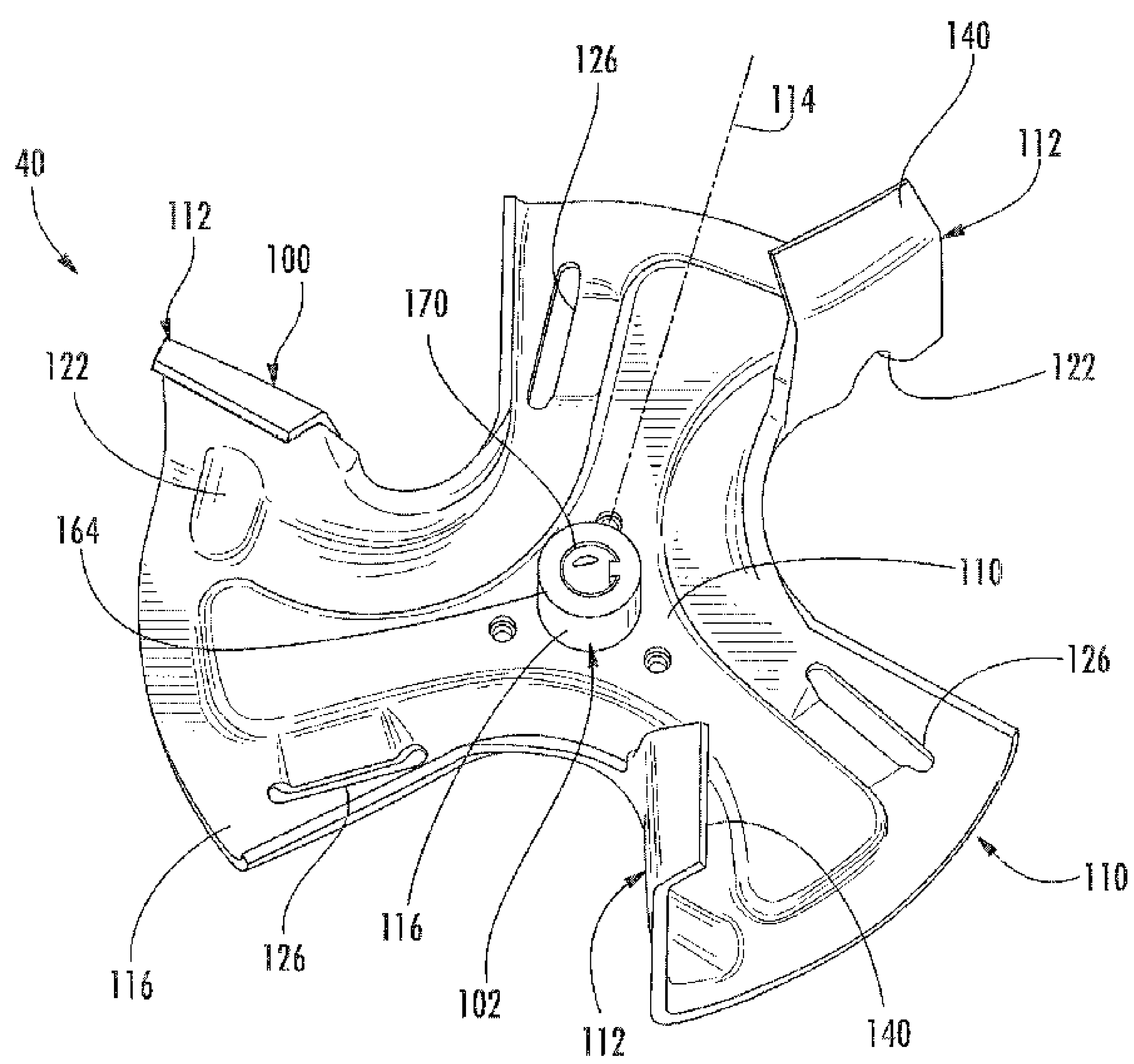
(57) **ABSTRACT**

A snow thrower impeller includes a layer of material comprising a blade support wall and blades extending from the blade support wall.

26 Claims, 7 Drawing Sheets



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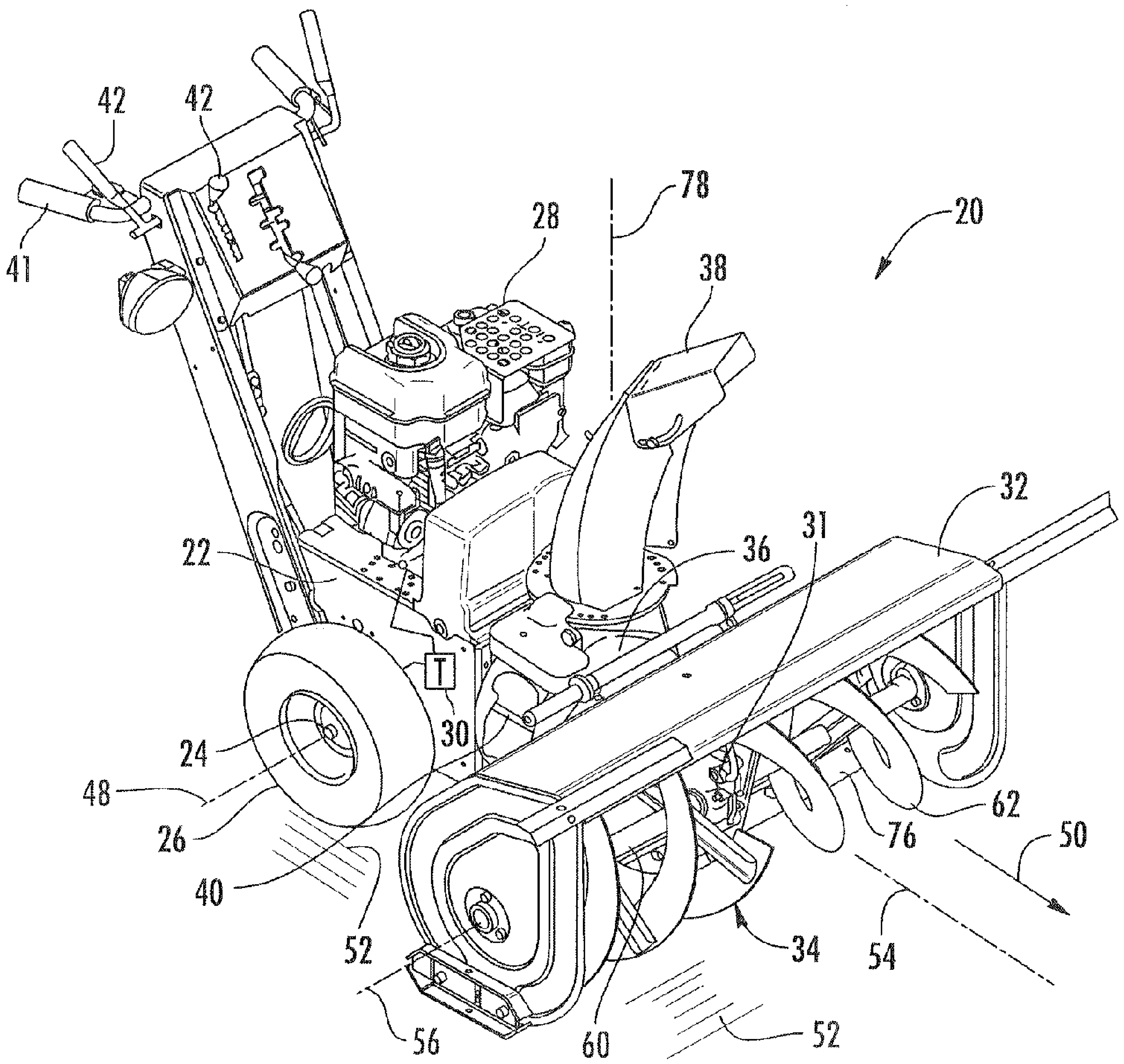
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FIG. 1

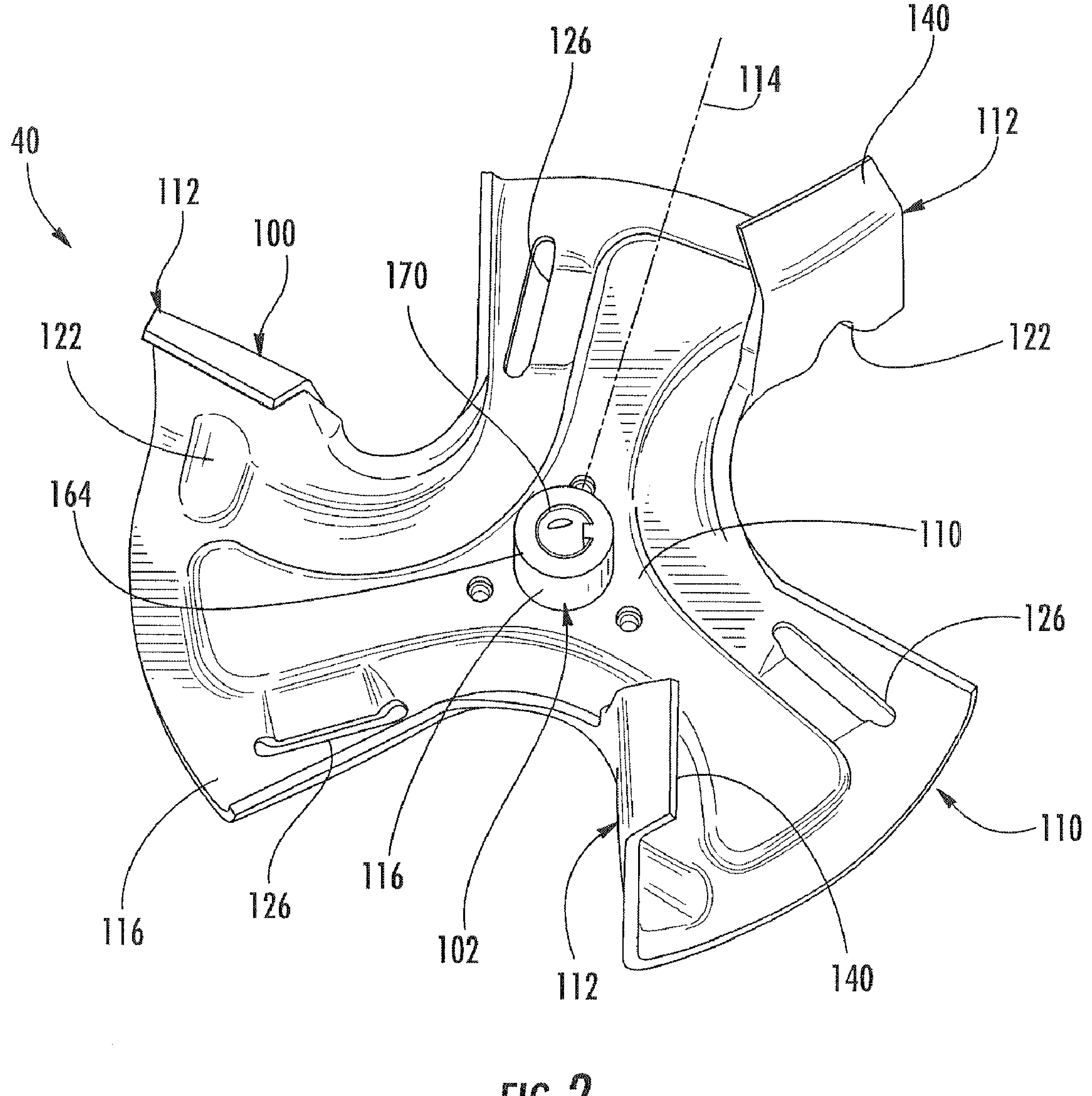
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FIG. 2

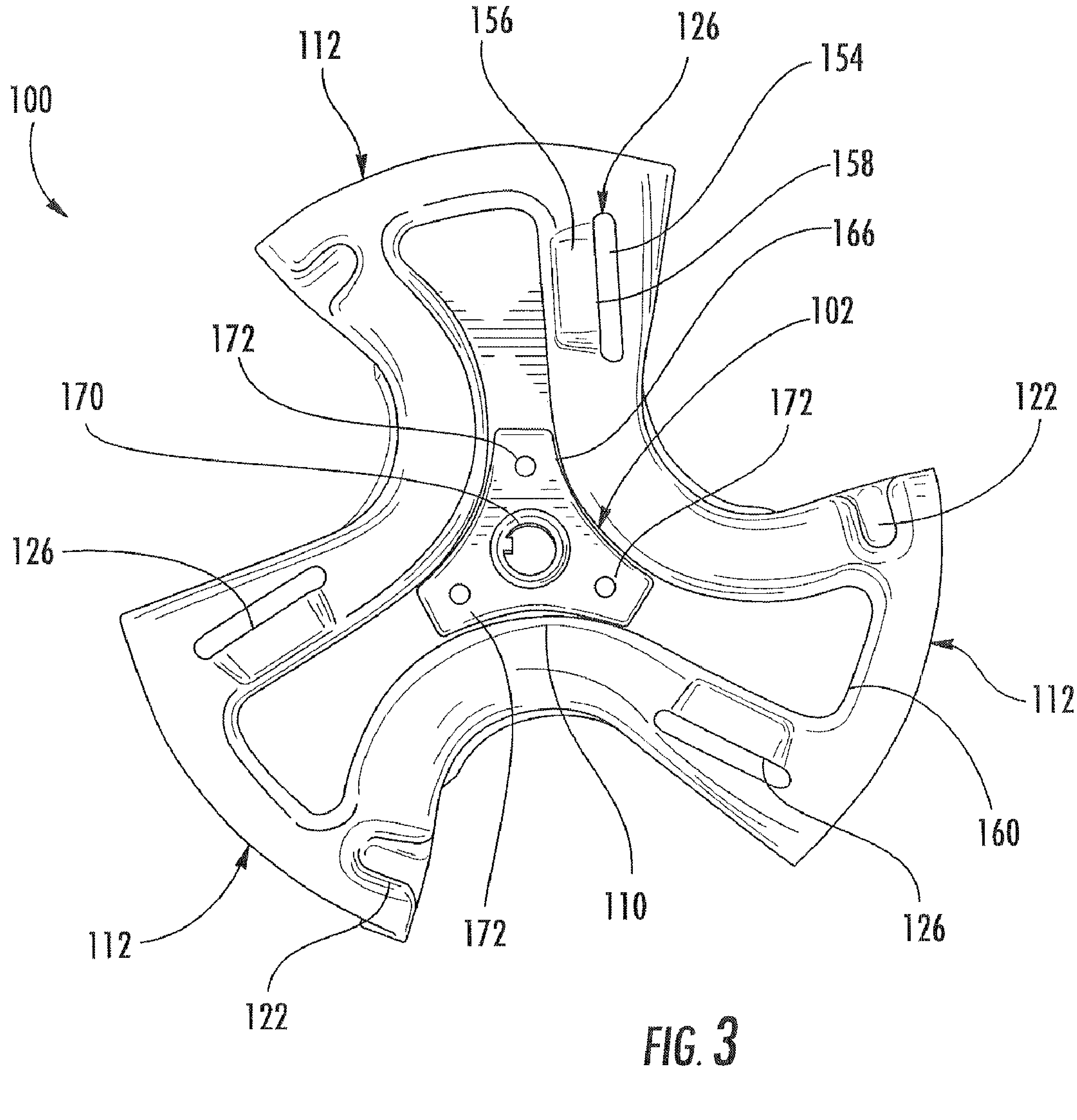
100
112
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FIG. 3

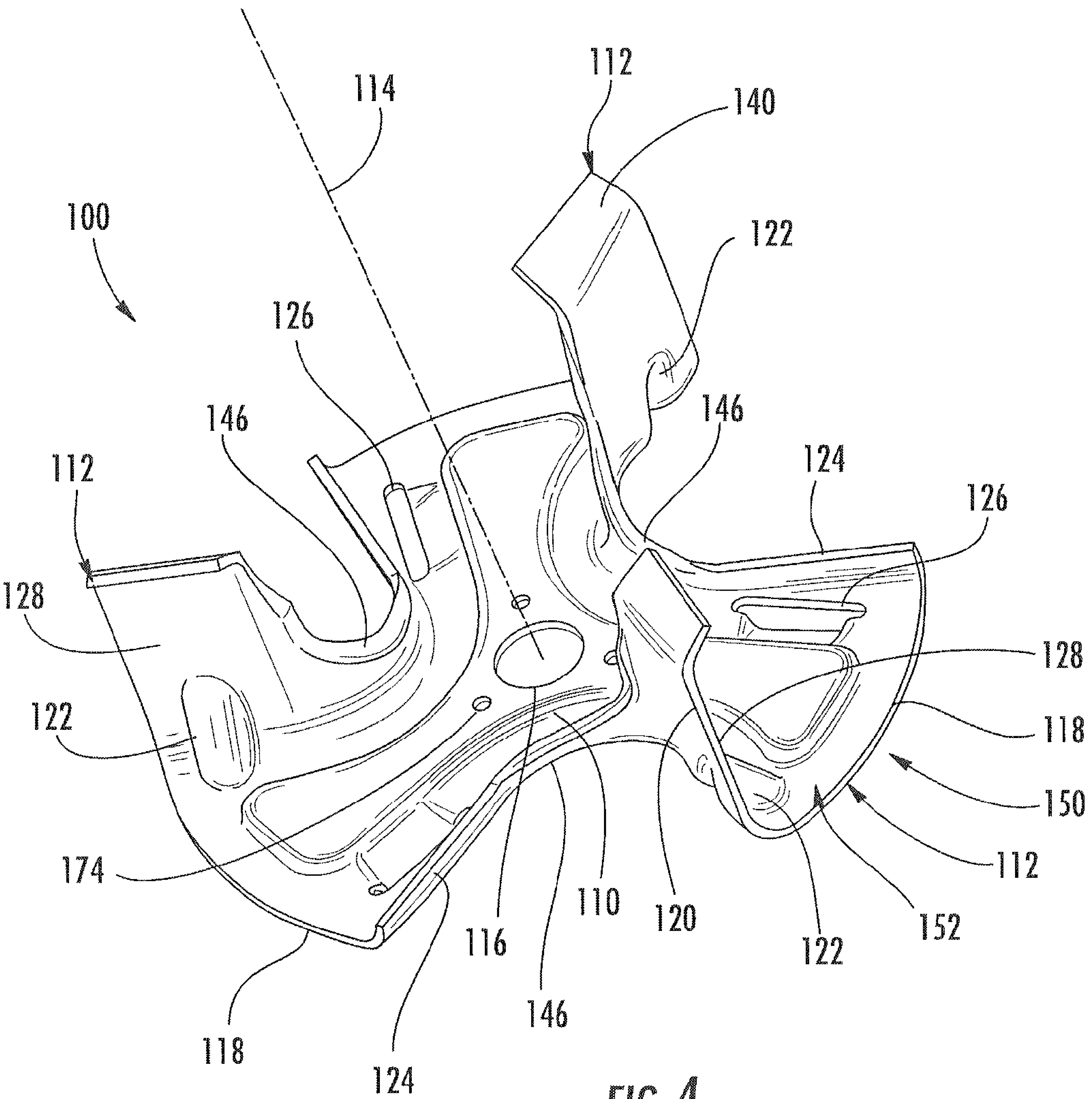
114
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FIG. 4

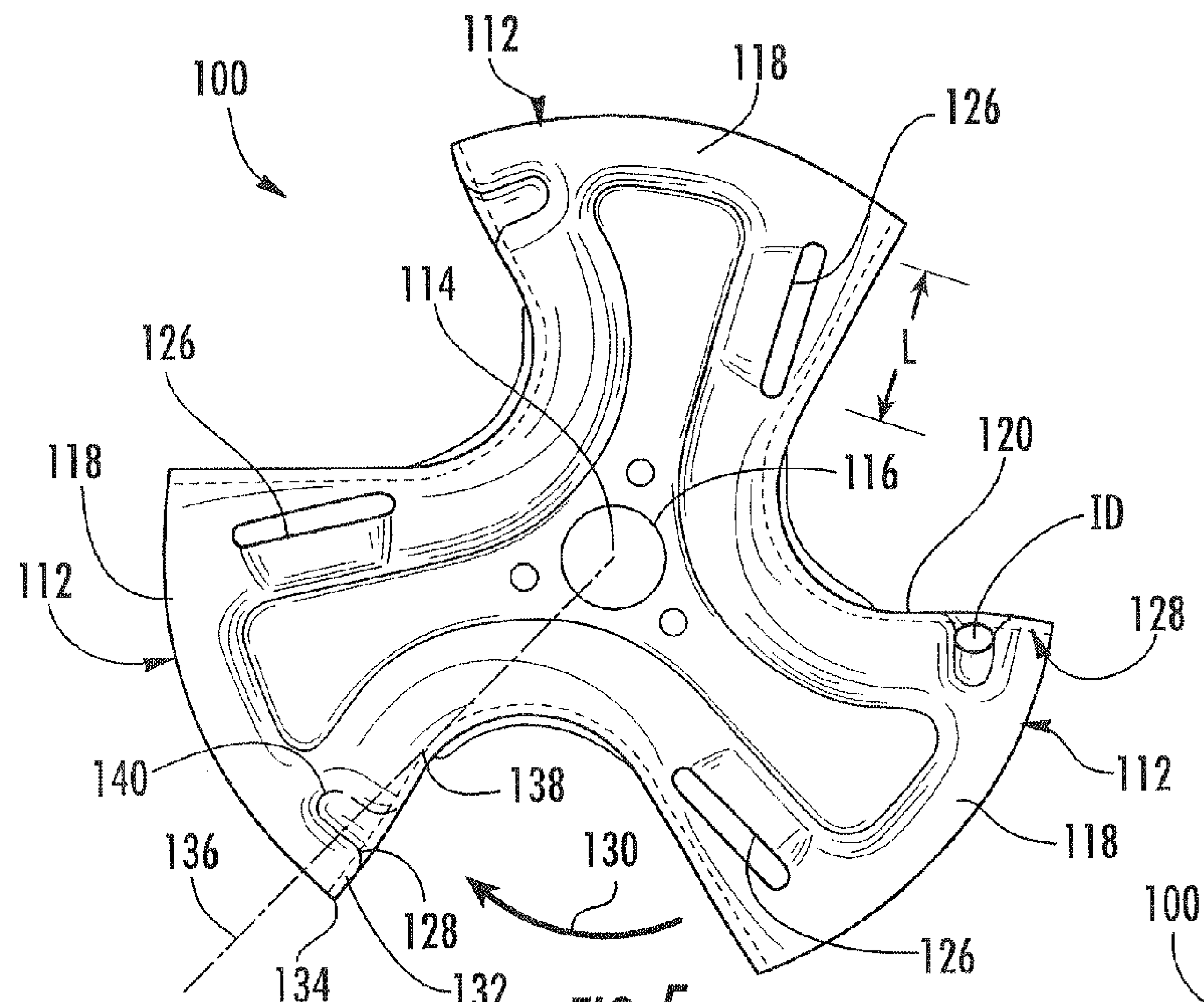


FIG. 5

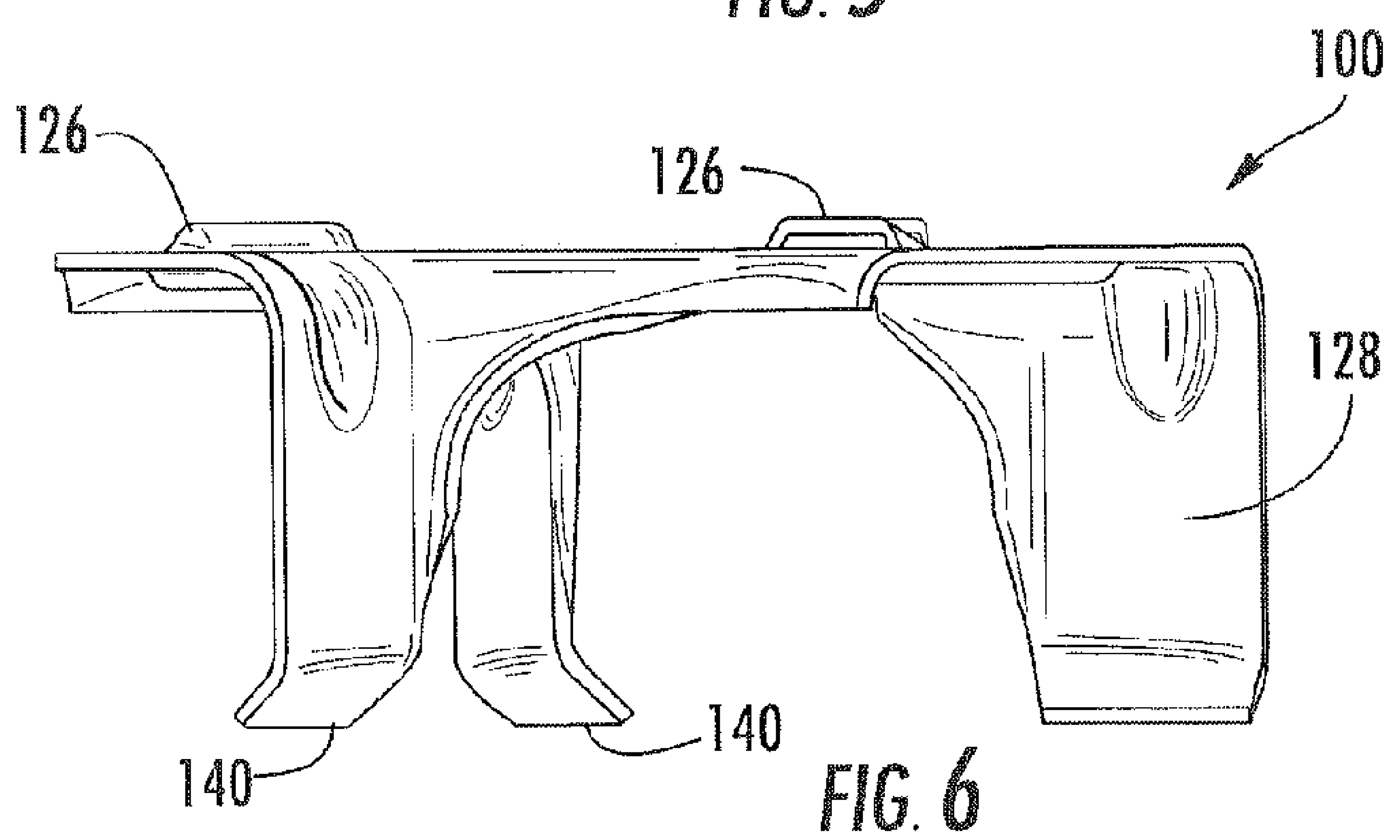


FIG. 6

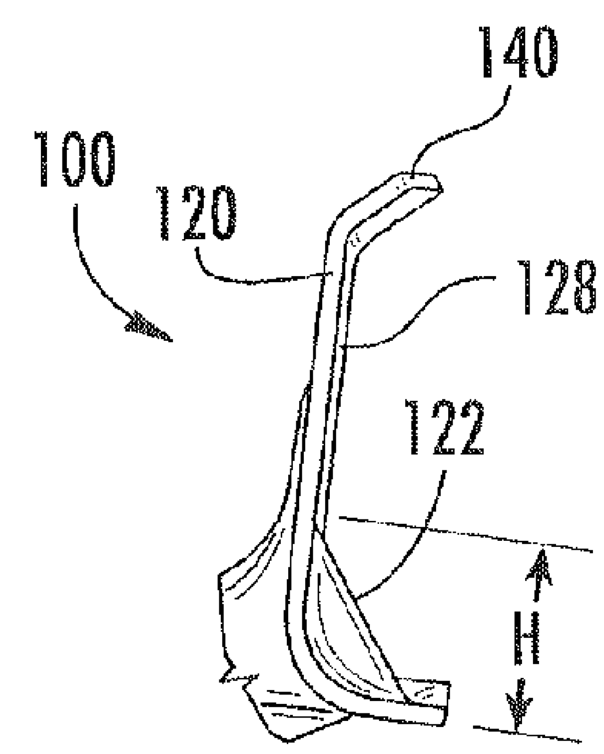


FIG. 8

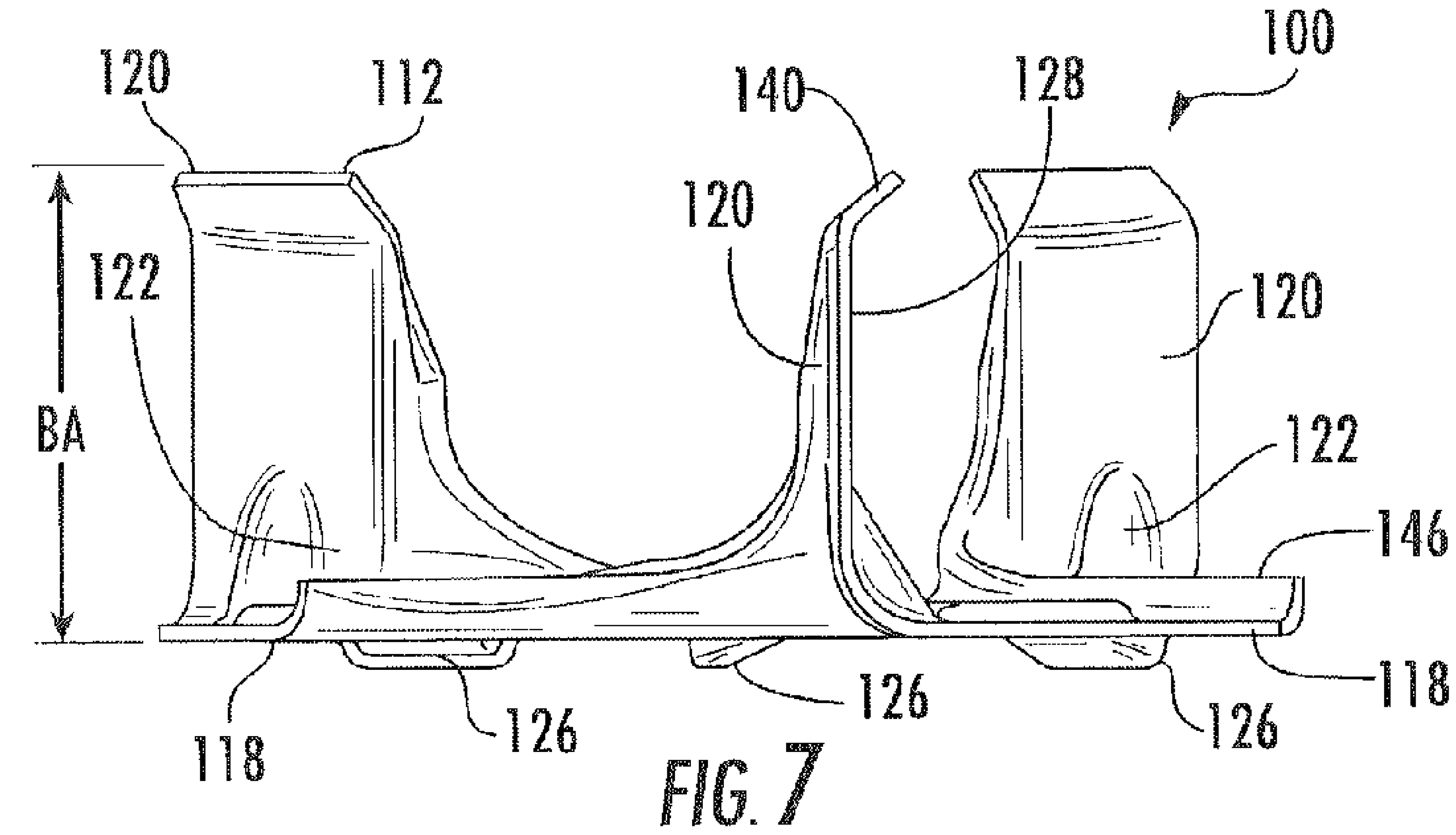


FIG. 7

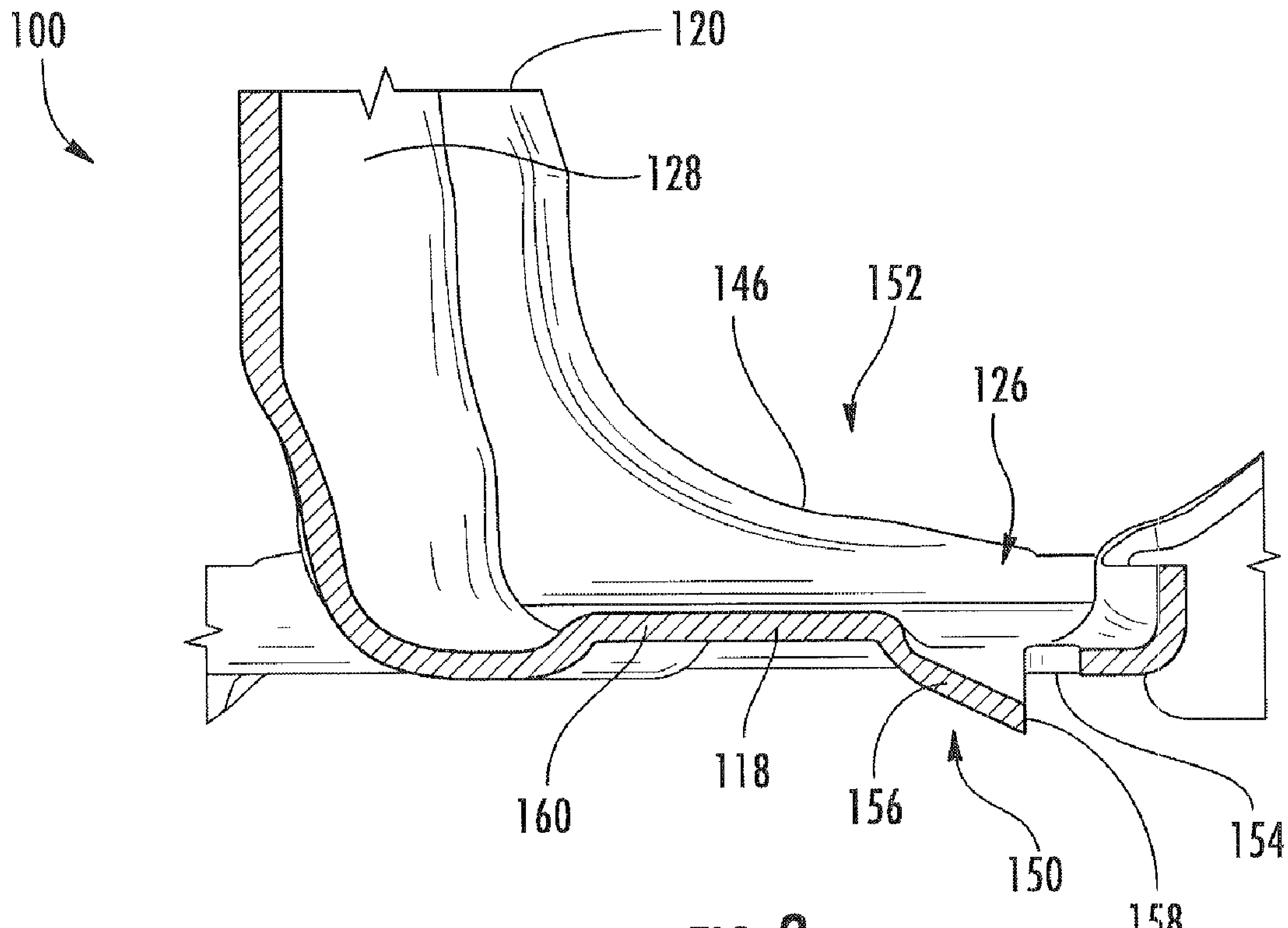
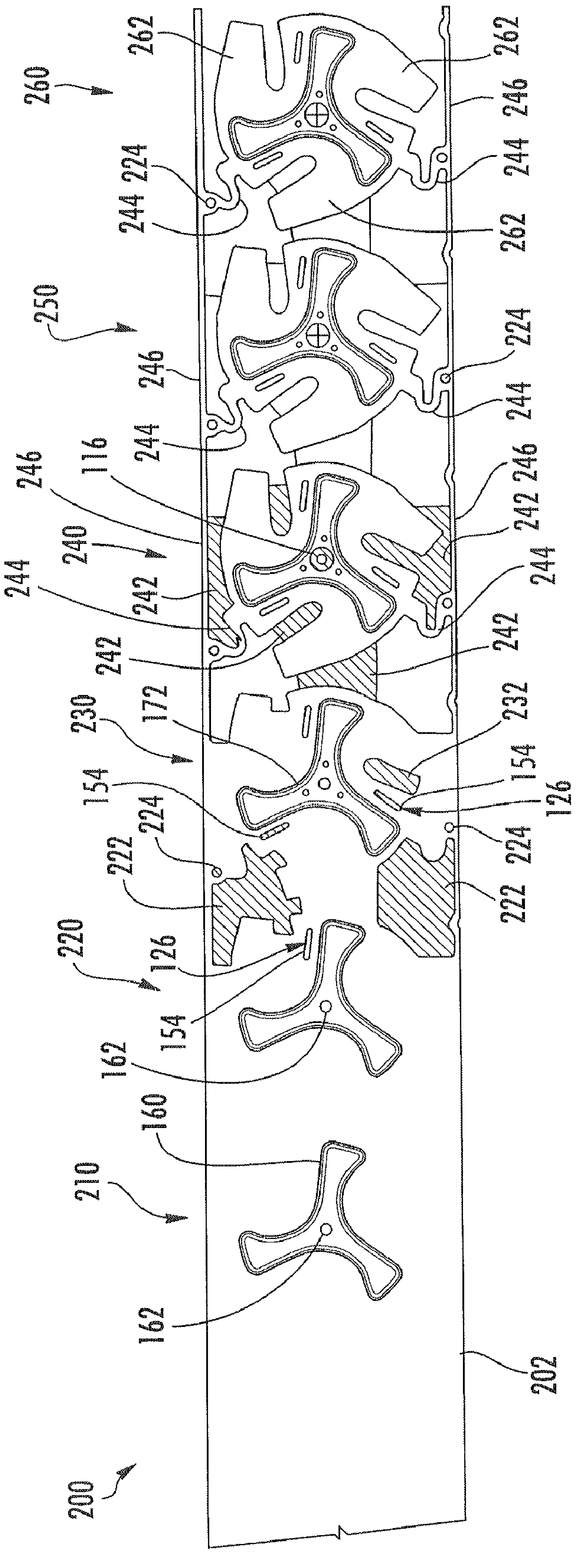


FIG. 9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172
232
154
154
126
224
224
222
222
220
126
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162
160
210
162
202
200

FIG. 10

SNOW THROWER IMPELLER

BACKGROUND

Snow throwers, also known as snow blowers, utilize an impeller to throw snow. Existing snow thrower impellers may not efficiently throw the snow and may be expensive and difficult to manufacture.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a snow thrower including an impeller assembly according to an example embodiment.

FIG. **2** is a top perspective view of the impeller assembly of FIG. **1**.

FIG. **3** is a rear perspective view of the impeller assembly of FIG. **2**.

FIG. **4** is a top perspective view of an impeller of the impeller assembly of FIG. **2**.

FIG. **5** is a bottom plan view of the impeller of FIG. **4**.

FIG. **6** is a first side elevational view of the impeller of FIG. **4**.

FIG. **7** is a second side elevational view of the impeller of FIG. **4**.

FIG. **8** is a sectional view of the impeller of FIG. **4**.

FIG. **9** is a sectional view of the impeller of FIG. **4**.

FIG. **10** is a top plan view of a strip layout for forming the impeller of FIG. **4**.

DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

FIG. **1** is a front perspective view of a snow thrower **20** according to an example embodiment. As will be described hereafter, snow thrower includes an impeller assembly **40** having a simple and inexpensive impeller that efficiently throws snow. In addition to impeller assembly **40**, snow thrower **20** includes frame **22**, axle **24**, wheels **26**, engine **28**, drive transmission **30** (schematically shown), discharge transmission **31**, auger housing **32**, auger **34**, impeller housing **36** and discharge chute **38**.

Frame **22** comprises one or more structures supporting the remaining components of snow thrower **20**. In the example illustrated in which snow thrower **20** is a walk-behind snow thrower, frame **22** supports axle **24**, wheels **26**, engine **28**, drive transmission **30**, auger housing **32**, auger **34**, impeller housing **36**, discharge chute **38** and impeller assembly **40**. Frame **22** further supports handles or grips **41** and controls **42**. In other embodiments where snow thrower **20** comprises a riding snow thrower, frame **22** may additionally support a seat and may be supported by a greater number of wheels, tracks or other ground propulsion members. In embodiments where snow thrower **20** is mounted to another vehicle, such as a lawnmower, an all terrain vehicle, truck or the like, frame **22** may or may not support axle **24** and wheels **26** and may be configured to be removably mounted to the vehicle. In embodiments where snow thrower **20** is powered by the engine or other torque source of the vehicle to which snow thrower **20** is mounted, frame **22** may not support an engine, such as engine **28**, and may alternatively merely comprise a mounting structure or bracket supporting auger housing **32**, auger **34**, impeller housing **36**, discharge chute **38** and impeller assembly **40** and facilitating their connection to the vehicle. Frame **22** may have a variety of different sizes and shapes, depending upon the machine or the method by which snow thrower **20** is moved across the terrain.

Axle **24** is supported by frame **22** and rotationally supports wheels **26** (both of which are shown in FIG. **2**). In the example illustrated, axle **24** is configured to be rotationally driven by engine **28** using torque transmitted by transmission **30**. Axle **24** extends along an axis **48** that is substantially perpendicular to the direction of travel **50** of snow thrower **20**.

Wheels **26** are joined to axle **24** so as to elevate and support frame **22** above the terrain **52**. Wheels **26** further facilitate movement of snow thrower **20** across terrain **52**. In the example illustrated, wheels **26** are rotationally driven to propel snow thrower **20**. In other embodiments, wheels **26** may be physically pushed by a person or other vehicle. In some embodiments, wheels **26** may be replaced with one of more tracks or other ground engaging members. In embodiments where snow thrower **20** is supported along the terrain by another vehicle, axle **24** as well as wheels **26** may be omitted.

Engine **28** comprises an internal combustion engine supported by frame **22** and operably coupled to wheels **26** by drive transmission **30** so as to drive wheels **26**. Engine **28** is further operably coupled to auger **34** and impeller assembly **40** by discharge transmission **31** so as to rotationally drive auger **34** about axis **56** and so as to rotationally drive impeller assembly **40** about axis **54**. In other embodiments, engine **28** may alternatively only drive auger **34** and impeller assembly **40**. In other embodiments, other mechanisms may be used to drive auger **34**, impeller assembly **40** or drive wheels **26**.

Transmission **30** (schematically shown) comprises a series or arrangement of structures configured to transmit torque from engine **28** to axle **24** or wheels **26**. Likewise, discharge transmission **31** comprises a series or arrangement of structures configured to transmit torque from engine **28** to auger **34** and impeller assembly **40**. Examples of such structures include, but are not limited to, drive shafts and driven shafts, chain and sprocket arrangements, belt and pulley arrangements, gear trains and combinations thereof. In one embodiment, transmission **31** is disposed on both sides of impeller **34**, wherein transmission **36** extends between engine **28** and impeller assembly **40** and wherein transmission **36** further extends between impeller assembly **40** and auger **34**. For example, in one embodiment, transmission **36** may include a bevel gear between impeller assembly **40** and auger **34** for converting torque about axis **54** from impeller assembly **40** to torque about axis **56** for auger **34**.

Auger housing **32** forms the head of snow thrower **20** and partially extends about or partially surrounds auger **34**. Auger housing **32** rotationally supports auger **34** for rotation about axis **56** which is perpendicular to axis **54** and the direction of forward travel **50**. Auger housing **32** contacts and scrapes against terrain **52** so as to scrape and lift snow from terrain **52** and towards impeller assembly **40**.

Auger **34** comprises a mechanism configured to slice or cut through snow and to direct or move such snow towards impeller assembly **40**. Auger **34** includes a central shaft **60** supporting a helical ribbon or blade **62**. Shaft **60** is rotationally supported about axis **54**. Blade **62** cuts through the snow and directs snow towards axis **54** and towards an inlet opening to impeller **34**. In other embodiments, auger **32** may have other configurations. For example, in lieu comprising ribbons, blade **62** may comprise full blades continuously extending from shaft **60**.

Impeller housing **36** extends about impeller assembly **40** and opens into an interior of auger housing **32**. Impeller housing **36** further opens into chute **38**. Impeller housing **38** cooperates with impeller assembly **40** such that snow impelled or moved by impeller assembly **40** is directed up and through chute **38**.

Chute **38** comprises one or more structures configured to receive snow impelled by impeller **34** and to direct such snow away from snow thrower **20**. In the example illustrated, chute **38** is configured to be selectively rotated about a substantially vertical axis **78** such that snow may be blown or thrown to either transverse side of snow thrower **20** and at various rear and forward angles with respect to snow thrower **20**. In one embodiment, chute **38** is configured to be manually rotated about axis **78**. In other embodiments, such rotation may be powered. In yet other embodiments, chute **38** may be stationary.

Impeller assembly **40** is configured to receive the snow gathered and directed to it by auger **34** and to further impel snow away from snow thrower **20** through chute **38**. FIGS. **2** and **3** illustrate impeller assembly **40** in more detail. Impeller assembly **40** includes impeller **100** and shaft coupler **102**.

Impeller **100** is shown removed from shaft coupler **102** in FIGS. **4-9**. As shown by FIG. **4**, impeller **100** comprises a single layer of material shaped to form and provide a central portion **110** and a plurality of scoops or shovels **112** angularly spaced about central portion **110**. In one embodiment, impeller **100** is formed from stamping a sheet of material, such as low carbon steel, wherein the three-dimensional structures of impeller **100** are formed by bending or deforming portions of the sheet. Because impeller **100** is formed by stamping a sheet of material and because its three-dimensional structures are formed by solely by deforming or bending portions of the sheet, the manufacture of impeller **100** may be done without welding or with minimal welding or molding and with a minimal number of fasteners, reducing manufacturing time, cost and complexity. In other embodiments, impeller **100** may be formed by other manufacturing processes. In one embodiment, the sheet of material may comprise a single homogenous layer of material. In other embodiments, the sheet of material may include multiple laminations of material to form a sheet which is subsequently shaped, such as being stamped and deformed.

Central portion **110** comprises that portion of impeller **100** that joins or interconnects each of shovels **112**. Central portion **110** further facilitates connection of impeller **100** to shaft coupler **102** (shown in FIGS. **2** and **3**). Central portion **110** extends generally perpendicular to a rotational axis **114** of impeller **100**. Central portion **110** includes an aperture **116** configured to receive shaft coupler **102**.

Shovels **112** comprise structures configured to scoop and throw snow through discharge chute **38**. Each shovel **112** includes a back or blade supporting wall **118**, blade **120**, depression gusset **122**, web **124** and louver **126**. Blade support wall **118** serves as a back, bottom or floor of each shovel **112**. Blade support wall **118** comprises a generally planar portion of impeller **100** extending from central portion **110** substantially perpendicular to the rotational axis **114** of impeller **100**.

Blade **120** of each shovel **112** extends from an associated blade supporting wall **118**. In the example, each blade **120** comprises an upstanding wall extending in a largely radial direction with respect to rotational axis **114**. Each blade **120** extends from a trailing radial edge of each blade supporting wall **118**. Each blade **120** has a snow driving face **128** facing in a direction in which impeller **100** is rotated by engine **28** (shown in FIG. **1**). For purposes of this disclosure, the term "snow driving face" means those surfaces that contact and force or throw snow through a discharge chute when the impeller is being driven.

FIG. **5** is a top view of impeller **100** illustrating the snow driving face **128** of each blade **120**. As indicated by arrow **130** in FIG. **5**, impeller **100** is configured to be driven in a clockwise direction (a "forward direction") about axis **114** by engine **28** (shown in FIG. **1**). Each snow driving face **128** extends behind its associated or corresponding blade supporting wall **118**. Said another way, the blade support wall **118** of each shovel **112** extends along the base of snow driving face **128** and projects forward in the rotational direction of impeller **100**. As a result, blade support wall **118** assists in carrying and supporting snow being driven by snow driving face **128** prior to throwing of the snow through discharge chute **38** (shown a FIG. **1**).

As further shown by FIG. **5**, the snow driving face **128** of each blade **120** includes a recessed portion **132** proximate an outermost radial tip **134** that faces and is recessed from a plane **136** containing rotational axis **114** and extending from rotational axis **114** tangent to the snow driving face **128** of the blade **120**. For purposes of this disclosure, the term "tangent" means to touch a curve or surface at a point so that it is closer to the curve in the vicinity of the point than any other line or plane drawn through the point. Because snow driving face **128** includes recessed portion **132**, snow driving face **128** more effectively throws snow through discharge chute **38**.

In the example embodiment illustrated, recessed portion **132** of snow driving face **128** is concave. In one embodiment, recessed portion **132** has a radius of curvature of between 16 inches and 22 inches. In the example illustrated, snow driving face **128** additionally includes a convex portion **138** facing the plane between recessed portion **132** and the rotational axis **114** of impeller **100**. The convex portion **138** further enhances the snow throwing efficiency of snow driving face **128** of blade **120**.

In other embodiments, snow driving face **128** may have other configurations. For example, in other embodiments, recessed portion **132** of snow driving face **128** may not be concave, but may instead be planar or flat or may be convex. In some embodiments, convex portion **138** may be omitted. In yet other embodiments, recessed portion **132** may be omitted, wherein snow driving face **128** extends within plane **136** or forward of plane **136**.

As shown by FIGS. **6** and **7**, each blade **120** additionally includes an angled top or tip portion **140**. Each tip portion **140** extends oblique from snow driving face **128** in the forward direction from snow driving face **128**. Tip portion **140** cooperate with snow driving face **128** of blade **120** and blade supporting wall **118** to contact snow on three sides to facilitate scooping and caring of snow to discharge chute **38** (shown in FIG. **1**). In other embodiments, tip portion **140** may be omitted.

As shown by FIGS. **6** and **8**, depression gussets **122** comprise indentations formed in the layer, wherein the indentations are angled so as to extend between and unite blade supporting wall **118** and blade **120**. Depression gussets **122** serve as trusses for reinforcing and rigidifying blade **120**. Because depression gussets **12** are formed by deforming the layer of material, rather than welding or otherwise connecting additional structures, manufacturing cost and complexity of impeller **100** may be reduced.

As shown by FIG. **8**, each gusset **138** has a height, H, measured perpendicular from blade supporting wall **118**, of between 1.5 inches and 1.9 inches. As shown in FIG. **5**, each gusset **138** has an inside diameter ID of between 0.4 inches and 0.8 inches. As a result, the depression gussets **122** provide blade **120**, formed from low carbon nine gauge steel, with sufficient strength to engage, contact and throw snow. In other embodiments, depression gussets **122** may have other configurations or may be omitted.

As best shown by FIG. **4**, web **124** comprises an edge portion extending along a leading edge of each blade supporting wall **118** and to the next successive blade **120** of the next successive shovel **112**. Web **124** has a concave side **146** facing away from rotational axis **114** of impeller **100**. Web **124** rigidifies and strengthens blade supporting wall **118** as well as the next successive blade **120** of the next successive shovel **112**. In other embodiments, web **124** may be omitted or may have other configurations.

Louvers **126** are formed in blade supporting walls **118** of shovels **112**. Louvers **126** assist in removing snow and ice from a backside **150** of blade supporting walls **118** and directing such removed the snow and ice to an opposite front side **152** of blade supporting walls **118**. FIG. **9** is a sectional view of impeller **100** illustrating one of louvers **126** in more detail. As shown by FIG. **9**, each louver **126** comprises an opening **154** through blade supporting wall **118** between sides **150** and **152**. Each opening **154** is partially framed by a slanted fin or slat **156** having a scraping edge **158** projecting away from impeller **100** on side **150**. As shown by FIG. **4**, scraping edge **158** of each louver **126** faces in the forward direction, i.e., the direction in which impeller **100** is rotated by engine **28** about axis **114**.

During rotation of impeller **100**, snow and ice may sometimes collect under or behind blade supporting portion **118** between blade supporting portion **118** and an axial end of impeller housing **36**. The snow and ice buildup may damage impeller **100** or impeller housing **136**. The rotational impeller **100**, edge **158** scrapes or removes such built-up snow and ice, whereby the snow and ice passes through opening **154** to the front side **152** of impeller **100**. Continued rotation of impeller **100** causes snow driving face **128** of blade **120** to contact and throw the snow through discharge chute **38** (shown in FIG. **1**). As a result, the likelihood of snow and ice buildup and the likelihood of damage resulting from such build-up is reduced. Because louvers **126** are formed by stamping and deforming portions of a single layer of material forming impeller **100**, no additional steps or additional parts are utilized in providing louvers **126**.

According to one example embodiment, each scraping edge **158** has a length L (shown in FIG. **5**) of at least 1 inch and nominally between 1.1 inches and 1.5 inches. As a result, each scraping edge **158** sufficiently removes accumulated snow and ice. In other embodiments, louvers **126** may have other configurations or may be omitted. In the example embodiment illustrated, impeller **100** is specifically configured to be stamped and formed from a single sheet of material. As shown by FIG. **7**, impeller **100** includes three shovels spaced approximately 120 degrees apart from one another with no intervening shovels **112** therebetween and with no intervening blades therebetween. Because impeller **100** includes only three shovels **112** and only three blades **120**, each shovel **112** may be formed solely from a single stamped and deformed sheet (without any additional parts or components) and may be provided with a blade height, BH, measured perpendicularly from blade supporting wall **118**, of at least 4 inches and nominally between 4.45 inches and 5.5 inches. In other words, because impeller **120** consists of central portion **110** and three shovels **112**, each shovel **112** may be formed from a stamped sheet and may have a larger scooping volume, defined by the surface areas of blade supporting wall **118** and blade **120**, allowing shovels **112** to more efficiently discharge snow.

In the example illustrated, impeller **100** is specifically configured for self alignment with shaft coupler **102**. As shown by FIG. **3**, impeller **100** includes a non-circular depression **160** about aperture **116** (shown in FIG. **4**). Depression **160** extends into central portion **110**. In the example illustrated, depression **160** further radially extends outward from central portion **110** along each of blade supporting walls **118** of shovels **112**. As a result, depression **160** serves dual functions of self aligning with shaft coupler **102** and strengthening blade supporting walls **118** of shovels **112**. In the example illustrated, depression **160** includes three legs angularly spaced 120 degrees apart from one another and centrally extending along each shovel **112**. In other embodiments, depression **160** may have other configurations or may be omitted.

Shaft coupler **102** comprises a mechanism configured to connect impeller **100** to a shaft of transmission **31**. In the example illustrated, shaft coupler **102** is configured to be connected to impeller **100** without welding, facilitating easier manufacture of impeller assembly **40**. Shaft coupler **102** includes hub **164** and key portions **166**. Hub **164** is configured to be inserted through aperture **161** and includes a central bore **170** configured to receive the shaft (not shown) of transmission **31**. In one embodiment, the shaft may be secured to hub **164** with a set screw **171** (shown in FIG. **3**). In other embodiments, the shaft may be secured to hub **164** in other fashions.

Key portions **166** comprise extensions extending from hub **164** which are sized and located so as to be mated or keyed into the noncircular depression **160**. In the example illustrated, depression **160** includes three fingers or extensions equiangularly spaced about axis **114** (spaced 120 degrees in the embodiment shown), whereas coupler **102** includes a corresponding three projections or fingers which are received within depression **160**. As a result, coupler **102** provides an intracal key such that impeller **100** is rotated with the rotation of the shaft connected to hub **164**. In other embodiments, shaft coupler **102** may have other configurations or may be omitted where other mechanisms are used for joining transmission **31** to impeller **100**.

As shown by FIG. **3**, each of key portions **166** additionally includes a bore **172** through which a fastener may extend into central portion **110** to further secure shaft coupler **102** to impeller **100**. In one embodiment, central portion **110** includes corresponding bores **174** (shown in FIG. **4**) through which fasteners may extend. In one embodiment, one or both of bores **172**, **174** may be internally threaded. In other embodiments, such fasters may comprise bolts and corresponding nuts. In still other embodiments, other mechanisms may be used to retain coupler **102** to impeller **100**.

FIG. **10** is a strip layout **200** illustrating one example method for forming impeller **40** as shown in FIG. **4**. From left to right, strip layout **200** illustrates various stamping, embossing and forming steps or stages for transforming a layer or sheet of material into a three-dimensional impeller such as impeller **40**. As noted above, in one embodiment, impeller **40** is formed from a coil, sheet or strip **202** of 9 gauge low carbon steel. In other embodiments, other materials or thicknesses may be employed for forming impeller **40**.

In the example illustrated, in a first step or stage **210**, an embossing device or tool deforms strip **202** to form depression **160**. A stamping tool also works upon strip **202** to form an initial pilot hole **162** that is used for alignment of subsequent tooling with strip **202**.

In stage **220**, a stamping tool or die engages strip **202** to form the opening **154** and slat **156** (shown in FIG. **9**) of a louver **126**. In addition, tooling further engages strip **202** to cut out portions **222** and pilot holes **224**. In step or stage **230**, the tooling forms openings **154** and slats **156** of the other louvers **126** and further forms bores **172**. The tooling also cuts out or removes portion **232**.

In stage **240**, tooling works upon strip **202** to cut out or form aperture **116**. The tooling further removes portions **242** to form expansion webs **244** extending from carrier **246**. In stage or step **250**, tooling works upon strip **202** to provide each blade **120** (shown in FIG. **4**) with its cup shape and to further bend tip portions **140**. Lastly, in step **260**, the tooling works upon strip **202** to deform and bend portions **262** to form blades **120**, providing blades **120** with their generally perpendicular orientation with respect to supporting wall **118** as shown in FIG. **4**. After impeller **40** is substantially completed, the individual impeller part is separated from carrier **246** by severing the impeller part from expansion web **244**. As shown in FIG. **10**, impeller **40** is formed without welding or other complex or time-consuming fabrication processes.

Although the present disclosure has been described with reference to example embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the claimed subject matter. For example, although different example embodiments may have been described as including one or more features providing one or more benefits, it is contemplated that the described features may be interchanged with one another or alternatively be combined with one another in the described example embodiments or in other alternative embodiments. Because the technology of the present disclosure is relatively complex, not all changes in the technology are foreseeable. The present disclosure described with reference to the example embodiments and set forth in the following claims is manifestly intended to be as broad as possible. For example, unless specifically otherwise noted, the claims reciting a single particular element also encompass a plurality of such particular elements.

What is claimed is:

1. A snow thrower comprising:
- an engine;
- an auger housing configured to receive a snow;
- an auger within the auger housing and operably coupled to the engine so as to be driven by the engine;
- an impeller housing configured to receive snow driven by the auger from the auger housing;
- a discharge chute extending from the impeller housing; and
- an impeller within the impeller housing and operably coupled to the engine so as to be driven by the engine to discharge snow from the impeller housing through the discharge chute, the impeller comprising:
- a layer of material comprising:
- a blade support wall; and
- three blades extending from the blade support wall and spaced 120 degrees about a rotational axis of the impeller with no other blades between the three blades, each of the three blades having a height measured perpendicularly from the blade support wall of at least 4 inches, wherein each of the three blades has a recessed portion proximate an outermost tip of the blade, the recessed portion facing and recessed from a plane that contains the rotational axis of the impeller and that extends from the rotational axis tangent to the snow driving face.

2. The snow thrower of claim **1**, wherein the recessed portion is concave.

3. The snow thrower of claim **1**, wherein the recessed portion has a radius of curvature of between 16 inches and 22 inches.

4. The snow thrower of claim **1**, wherein the snow driving face includes a convex portion between the recessed portion and the rotational axis of the impeller.

5. The snow thrower of claim **1**, wherein each of the three blades has a snow driving face, the snow driving face of each blade facing in a direction about the rotation axis of the impeller and wherein the impeller further comprises louvers extending through the blade support wall, each louver facing in the direction.

6. The snow thrower of claim **5**, wherein each of the three blades project from a first side of the blade support wall and wherein the louvers have fins projecting from a second side of the blade support wall opposite the first side.

7. The snow thrower of claim **1**, wherein each of the three blades has a snow driving face, the snow thrower further comprising a depression gusset in the snow driving face of each blade and extending from the blade to the blade support wall, each depression gusset having a maximum inside diameter of between 0.4 inches and 0.8 inches and a height measured perpendicularly from the blade support wall of between 1.5 inches and 1.9 inches.

8. The snow thrower of claim **1**, wherein the impeller further comprises:
- an aperture through the layer; and
- a non-circular depression in the layer about the aperture;
- wherein the snow thrower further comprises a shaft coupler comprising:
- a hub received within the aperture and configured to mount to a shaft; and
- key portions extending from the hub and received within the non-circular depression so as to key the hub to the impeller.

9. The snow thrower of claim **8** further comprising fasteners extending through the layer into the key portions.

10. The snow thrower of claim **1**, wherein each of the three blades has a snow driving face and wherein the snow thrower further comprises a web extending and tapering from the snow driving face of each blade on a same side of the impeller as the snow driving face to a perimeter of the blade support wall.

11. The snow thrower of claim **10**, wherein the web has a concave side facing away from the rotational axis of the impeller.

12. The snow thrower of claim **1**, wherein each of the three blades has a snow driving face and wherein each blade has a top portion extending oblique from the snow driving face.

13. The snow thrower of claim **1**, wherein each of the three blades include a snow driving face facing in a direction and wherein the blade support wall extends along a base of the snow driving face and projects in the direction from the snow driving face.

14. A snow thrower impeller comprising:
- a layer of material comprising:
- a central portion about a rotational axis of the impeller; and
- a plurality of shovels extending from the central portion, each shovel comprising:
- a blade having a snow driving face facing in a direction; and
- a blade support wall extending along a base of the snow driving face and projecting in the direction from the snow driving face, wherein the blade of each shovel has a recessed portion proximate an outermost tip of the blade, the recessed portion facing and recessed from a plane that contains the rotational axis of the impeller and that extends from the rotational axis tangent to the snow driving face.

15. The snow thrower impeller of claim **14**, wherein the snow driving face of each blade face in a first direction about the rotation axis of the impeller and wherein the impeller further comprises louvers extending through the blade support wall, each louver facing in the first direction.

16. The snow thrower impeller of claim **14**, further comprising a depression gusset in the snow driving face of each blade and extending from the blade to the blade support wall, each depression gusset having a maximum inside diameter of between 0.4 inches and 0.8 inches and a height measured perpendicularly from the blade support wall of between 1.5 inches and 1.9 inches.

17. The snow thrower impeller of claim **14**, wherein the impeller further comprises:

an aperture through the layer;

a non-circular depression in the layer about the aperture; and

a shaft coupler comprising:

a hub received within the aperture and configured to mount to a shaft; and

key portions extending from the hub and received within the non-circular depression so as to key the hub to the impeller.

18. The snow thrower impeller of claim **14** further comprising a web extending and tapering from the snow driving face of each blade on a same side of the impeller as the snow driving face to a perimeter of the blade support wall.

19. A snow thrower impeller comprising:

a layer of material comprising:

a blade support wall; and

three blades extending from the blade support wall and spaced 120 degrees about a rotational axis of the impeller with no other blades between the three blades, each of the three blades having a height measured perpendicularly from the blade support wall of at least 4 inches and a snow driving face having a recessed portion proximate an outermost tip of the blade, the recessed portion facing and recessed from a plane that contains the rotational axis of the impeller and that extends from the rotational axis tangent to the snow driving face.

20. A method for making a snow thrower impeller, the method comprising:

stamping a sheet of material;

deforming of the sheet to form a plurality of shovels extending from the central portion, each shovel comprising:

a blade having a snow driving face facing in a direction; and

a blade support wall extending along a base of the snow driving face and projecting in the direction from the snow driving face, wherein the blade of each shovel has a recessed portion proximate an outermost tip of the blade, the recessed portion facing and recessed from a plane that contains the rotational axis of the impeller and that extends from the rotational axis tangent to the snow driving face.

21. The method of claim **20** further comprising forming louvers extending through the blade support wall.

22. A snow thrower comprising:

an engine;

an auger housing configured to receive a snow;

an auger within the auger housing and operably coupled to the engine so as to be driven by the engine;

an impeller housing configured to receive snow driven by the auger from the auger housing;

a discharge chute extending from the impeller housing;

an impeller within the impeller housing and operably coupled to the engine so as to be driven by the engine to discharge snow from the impeller housing through the discharge chute, the impeller comprising:

a layer of material comprising:

a blade support wall; and

three blades extending from the blade support wall and spaced 120 degrees about a rotational axis of the impeller with no other blades between the three blades, each of the three blades having a height measured perpendicularly from the blade support wall of at least 4 inches;

an aperture through the layer; and

a non-circular depression in the layer about the aperture; and

a shaft coupler comprising:

a hub received within the aperture and configured to mount to a shaft; and

key portions extending from the hub and received within the non-circular depression so as to key the hub to the impeller.

23. The snow thrower of claim **22** further comprising fasteners extending through the layer into the key portions.

24. A snow thrower impeller comprising:

a layer of material comprising:

a central portion about a rotational axis of the impeller;

a plurality of shovels extending from the central portion, each shovel comprising:

a blade having a snow driving face facing in a direction; and

a blade support wall extending along a base of the snow driving face and projecting in the direction from the snow driving face;

an aperture through the layer;

a non-circular depression in the layer about the aperture; and

a shaft coupler comprising:

a hub received within the aperture and configured to mount to a shaft; and

key portions extending from the hub and received within the non-circular depression so as to key the hub to the impeller.

25. A snow thrower comprising:

an engine;

an auger housing configured to receive a snow;

an auger within the auger housing and operably coupled to the engine so as to be driven by the engine;

an impeller housing configured to receive snow driven by the auger from the auger housing;

a discharge chute extending from the impeller housing; and

an impeller within the impeller housing and operably coupled to the engine so as to be driven by the engine to discharge snow from the impeller housing through the discharge chute, the impeller comprising:

a layer of material comprising:

a blade support wall; and

three blades extending from the blade support wall and spaced 120 degrees about a rotational axis of the impeller with no other blades between the three blades, each of the three blades having a height measured perpendicularly from the blade support wall of at least 4 inches, wherein each of the three blades has a snow driving face;

a web extending and tapering from the snow driving face of each blade on a same side of the impeller as the snow driving face to a perimeter of the blade support wall.

26. A snow thrower impeller comprising:

a layer of material comprising:

a central portion about a rotational axis of the impeller; and

a plurality of shovels extending from the central portion, each shovel comprising:

a blade having a snow driving face facing in a direction;

a blade support wall extending along a base of the snow driving face and projecting in the direction from the snow driving face; and

a web extending and tapering from the snow driving face of each blade on a same side of the impeller as the snow driving face to a perimeter of the blade support wall.

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